Table 1. Lists of genotypes used in the experiment

|  |  |  |
| --- | --- | --- |
| Code | Genotypes/pedigree | Seed source |
| G1 | THELIN/WAXWING//ATTILA\*2/PASTOR/3/INQALAB91\*2/TUKURU 9Y-0B | ICARDA |
| G2 | PASTOR//HXL7573/2\*BAU/2/SOKOLL/WBLL1/4/SAFI-1//NS732/HER/3/SAADA | ICARDA |
| G3 | PASTOR//HXL7573/2\*BAU/3/SOKOLL/WBLL1/4/SAFI-1//NS732/HER/3/SAADA | ICARDA |
| G4 | PASTOR//HXL7573/2\*BAU/4/SOKOLL/WBLL1/4/SAFI-1//NS732/HER/3/SAADA | ICARDA |
| G5 | SERI.1B//KAUZ/HEVO/3/AMAD/4/ESWYT99#18/ARRIHANE/5/SITTA/BUCHIN//CHIL/BOMB | ICARDA |
| G6 | PFAU/MILAN//FUNG MAI 24/3/ATTILA\*2/CROW | ICARDA |
| G7 | FLORKWA-2/85 Z 1284//ETBW 4920/3/LOULOU-18 | ICARDA |
| G8 | SHARP/3/PRL/SARA//TSI/VEE#5/5/VEE/LIRA//BOW/3/BCN/4/KAUZ/6/HUBARA-5 | ICARDA |
| G9 | CHEN/AEGILOPS SQUARROSA (TAUS)//BCN/3/VEE#7/BOW/4/PASTOR/5/HUBARA-1 | ICARDA |
| G10 | KAUZ/FCT//ETBW 4920/3/MILAN/PASTOR | ICARDA |
| G11 | FLORKWA-2/85 Z-1284//ETBW 4920/3/LOULOU-18 | ICARDA |
| G12 | REBWAH-11/QIMMA-12 | ICARDA |
| G13 | TEVEE-1/STAR'S'//ETBW 4920/3/TEPOCA+LR34/2\*BORL95 | ICARDA |
| G14 | MILAN/SHA7/3/THB/CEP7780//SHA4/LIRA/4/SHA4/CHIL/5/FARIS-6 | ICARDA |
| G15 | HUBARA-5/PASTOR-2//AREEJ | ICARDA |
| G16 | MEXIPAK/FLORKWA-2//KRASNOVODOPADSKAYA25/GRU-47 | ICARDA |
| G17 | KAUZ/PASTOR/3/ALTAR 84/AEGILOPS SQUARROSA (TAUS)//OPATA/4/WARDA | ICARDA |
| G18 | HUBARA-5/PASTOR-2//WARDA | ICARDA |
| G19 | HUBARA5/PASTOR2/6/88ZHONG218//CTK/VEE/3/KVZ/GV//PR/4/KRASNOVODOPADSKAYA25/5/KS82117/MLT | ICARDA |
| G20 | KAUZ/PASTOR/3/ALTAR 84/AEGILOPS SQUARROSA (TAUS)//OPATA/4/WARDA | ICARDA |
| G21 | KAUZ/PASTOR/3/ALTAR 84/AEGILOPS SQUARROSA (TAUS)//OPATA/3/WARDA | ICARDA |
| G22 | NESSER/SERI//TEVEE-1/SHUHA-6/3/JOUDI | ICARDA |
| G23 | HUBARA-3\*2/SHUHA-4//MURAJ | ICARDA |
| G24 | LAKTA-1/QAFZAH-21//KABEER | ICARDA |
| G25 | LALOUB1/5/PBWMUNIA//CHEN/ALTAR84/3/CHEN/AEGILOPSSQUARROSA(TAUS)//BCN/4/MARCHOUCH-83 | ICARDA |
| G26 | LALOUB-1 /3/91-142 a 139//TAM200/KAUZ | ICARDA |

|  |  |  |
| --- | --- | --- |
| Code | Genotypes/pedigree | Seed source |
| G27 | FLORKWA2/6/SAKER'S'/5/RBS/ANZA/3/KVZ/HYS//YMH/TOB/4/BOW'S'/7/DAJAJ6/8/MUNIA//CHEN/ALTAR84/3/CHEN/AEGILOPSSQUARROSA(TAUS)//BCN/4/MARCHOUCH-8 | ICARDA |
| G28 | FLORKWA2/6/SAKER'S'/5/RBS/ANZA/3/KVZ/HYS//YMH/TOB/4/BOW'S'/7/DAJAJ6/8/MUNIA//CHEN/ALTAR84/3/CHEN/AEGILOPSSQUARROSA(TAUS)//BCN/4/MARCHOUCH-9 | ICARDA |
| G29 | HUBARA-3\*2/SHUHA-4//NARC 2011 | ICARDA |
| G30 | DAJAJ-5/4/CMH82A.1294/2\*KAUZ//MUNIA/CHTO/3/MILAN/5/QAFZAH 18/6/HAMAM-4 | ICARDA |
| G31 | FENTALLE-2 (CHECK) | EIAR/WARC |
| G32 | HUBARA-8/3/MUNIA/ALTAR 84//MILAN/4/ANGI-2/5/AFIF | ICARDA |
| G33 | HUBARA8/3/MUNIA/ALTAR84//MILAN/4/ANGI2/5/CROW'S'/BOW'S'-3-1994/95//TEVEE'S'/TADINIA | ICARDA |
| G34 | HUBARA-8/3/MUNIA/ALTAR84//MILAN/4/ANGI-2/6/CROW'S'/BOW'S'-3-1994/95//TEVEE'S'/TADINIA | ICARDA |
| G35 | HUBARA8/3/MUNIA/ALTAR84//MILAN/4/ANGI­­ 2/5/CROW'S'/BOW'S'31994/95//TEVEE'S'/TADINIA | ICARDA |
| G36 | HUBARA-8/3/MUNIA/ALTAR 84//MILAN/4/ANGI-2/5/YAMAMA/SD 8036 | ICARDA |
| G37 | HUBARA-8/3/MUNIA/ALTAR 84//MILAN/4/ANGI-2/5/TENUR | ICARDA |
| G38 | HUBARA-8/3/MUNIA/ALTAR 84//MILAN/4/ANGI-2/6/TENUR | ICARDA |
| G39 | HUBARA-1/3/MUNIA/CHTO//MILAN/4/GOUMRIA-8/5/AFIF | ICARDA |
| G40 | HUBARA-1/3/MUNIA/CHTO//MILAN/3/GOUMRIA-8/5/AFIF | ICARDA |
| G41 | DAJAJ-5/4/CMH82A.1294/2\*KAUZ//MUNIA/CHTO/3/MILAN/5/QAFZAH-18/6/HAALA-44 | ICARDA |
| G42 | Pirsabak 2008/AZIZ | ICARDA |
| G43 | Punjab 2011/ORFAN | ICARDA |
| G44 | Punjab 2012/ORFAN | ICARDA |
| G45 | BABAGA-3/4/KAUZ//TRAP#1/BOW/3/QAFZAH-21-1 | ICARDA |
| G46 | KARAWAN-1/TALLO 3//REGRAG-1/3/OUASSOU-11 | ICARDA |
| G47 | HAMAM2/DEEK2/5/ACHTAR\*3//KANZ/KS8584/3/KATILA17/4/MON'S'/ALD'S'//ALDAN'S'/IAS58/6/HUBARA-3\*2/SHUHA-4 | ICARDA |
| G48 | BOW #1/FENGKANG 15//NESMA\*2/261-9/3/DUCULA/4/SIDS-1/5/Line-12 | ICARDA |
| G49 | MOUKA-4/RAYON//SIDS 12/5/SERI.1B//KAUZ/HEVO/3/AMAD/4/KAUZ/FLORKWA | ICARDA |
| G50 | GIRWILL-13/2\*PASTOR-2//KAUZ'S'/PREW | ICARDA |

|  |  |  |
| --- | --- | --- |
| Code | Genotypes/pedigree | Seed source |
| G51 | SHUHA-4/FLORKWA-4//HUBARA-3/3/MURAJ | ICARDA |
| G52 | HUBARA-15/ZEMAMRA-8//MASSIRA/4/FRAME//MILAN/KAUZ/3/PASTOR | ICARDA |
| G53 | KING BIRD (CHECK) | EIAR/KARC |
| G54 | REYNA-13/MASSIRA//SOONOT-10 | ICARDA |
| G55 | SAEED-1/BEZOSTAYA/4/MILAN/KAUZ//PASTOR/3/PASTOR | ICARDA |
| G56 | UTIQUE 96/FLAG-1//BETHLEHEM/3/SAAMID-2 | ICARDA |
| G57 | SERI.1B\*2/3/KAUZ\*2/BOW//KAUZ/4/ATTILA/HEILO/5/TAN//TEMPORALERAM 87/AGR/3/NG8319//SHA4/LIRA | ICARDA |
| G58 | CHAM-10/3/TNMU//MILAN/TUI/4/SANDALL-5 | ICARDA |
| G59 | KHIDER-1/5/PRL/SARA//TSI/VEE#5/4/TILHI/4/ATTILA/2\*PASTOR/6/FAISAL-1 | ICARDA |
| G60 | KHIDER-1/5/PRL/SARA//TSI/VEE#5/3/TILHI/4/ATTILA/2\*PASTOR/6/FAISAL-1 | ICARDA |
| G61 | SHARP/3/PRL/SARA//TSI/VEE#5/5/VEE/LIRA//BOW/3/BCN/4/KAUZ/6/MILAN/PASTOR/7/SUDAN#3/SHUHA-6 | ICARDA |
| G62 | MILAN/KAUZ/6/TOB/ERA//TOB/CNO67/3/PLO/4/VEE#5/5/KAUZ/7/MILAN/PASTOR/8/SANDALL-5 | ICARDA |
| G63 | MILAN/KAUZ//HD29/2\*WEAVER/3/MILAN/PASTOR/4/REYNA-4 | ICARDA |
| G64 | SHAMISS-5//HEILO/MIRIAM 41/3/ICARDA-SRRL-5 | ICARDA |

Table 2. Mean squares from analysis of variance for twelve traits of sixty four bread wheat genotypes evaluated at Werer Agricultural Research Center during 2019/20 under optimum condition

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Traits | Replications (d.f =1) | Block Within replication (Adj.)(d.f=14) | Treatments (d.f=63) | | Intra block Error (d.f=49) | RCBD Error(63) | Rel. effic.  (%) | CV (%) |
| (Unadj.) | (Adj.) |
| Days to heading | 0.38ns | 3.36ns | 13.27 | 12.08\*\* | 2.25 | 2.49 | 103.37 | 2.91 |
| Days to maturity | 3.44ns | 7.57ns | 29.37 | 27.79\*\* | 5.96 | 6.32 | 101.23 | 2.78 |
| Grain filling period | 6.13ns | 6.40ns | 18.8 | 18.50\*\* | 5.41 | 5.63 | 100.61 | 6.39 |
| Biomass yield (t/ha) | 0.01ns | 0.32ns | 7.64 | 7.01\*\* | 0.32 | 0.32 | 100.00 | 4.85 |
| Grain yield (t/ha) | 0.34ns | 0.04ns | 1.52 | 1.44\*\* | 0.11 | 0.09 | 85.24 | 8.32 |
| 1000-kernel weight (g) | 1.68\* | 5.98\*\* | 25.33 | 22.89\*\* | 8.23 | 7.73 | 93.93 | 7.77 |
| Harvest index (%) | 22.08ns | 2.14ns | 23.67 | 21.57\*\* | 6.91 | 5.85 | 84.67 | 7.64 |
| Plant height (cm) | 368.12\*\* | 24.74ns | 62.33 | 56.67\*\* | 21.96 | 22.58 | 100.31 | 7.26 |
| No. of fertile tillers plant-1 | 13.78ns | 1.73ns | 1.51 | 1.19\*\* | 0.45 | 0.73 | 100.39 | 14.16 |
| No. of spikelets spike-1 | 3.77ns | 0.98ns | 3.24 | 2.96\*\* | 0.87 | 0.89 | 100.30 | 5.85 |
| Spike length (cm) | 2.00\* | 0.44ns | 1.37 | 1.29\*\* | 0.46 | 0.45 | 96.96 | 10.00 |
| No. of kernels spike-1 | 92.29\* | 20.83ns | 56.70 | 55.35\*\* | 21.01 | 20.97 | 99.80 | 10.12 |

\*\* and ns indicates highly significant at (1%) and non-significant probability levels respectively, DF= degree freedom Rel.effic. = relative efficiency, RCBD=completely randomized block design, CV= coefficient of variations and adj. and unadj. = adjusted and unadjusted treatment mean square.

Table 3. Mean squares from analysis of variance for twelve traits of sixty four bread wheat genotypes evaluated at Werer Agricultural Research Center during 2019/20 under stressed condition

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Traits | Replications  (d.f =1) | Block Within replication (Adj.)(df=14) | Treatments (d.f=63) | | Intra block Error (d.f=49) | RCBD Error(63) | Rel. effic. (%) | CV (%) |
| (Unadj.) | (Adj.) |
| Days to heading | 2.53ns | 1.88ns | 21.63 | 18.84\*\* | 1.59 | 1.65 | 100.58 | 2.47 |
| Days to maturity | 150.95\*\* | 3.36ns | 31.84 | 29.22\*\* | 6.70 | 5.96 | 88.93 | 3.09 |
| Grain filling period | 40.50\*\* | 1.57ns | 11.95 | 11.28\*\* | 3.52 | 3.08 | 87.69 | 5.73 |
| Biomass yield (t ha-1) | 1.29ns | 0.24ns | 4.38 | 4.02\*\* | 0.50 | 0.44 | 88.63 | 9.02 |
| Grain yield (t ha-1) | 0.52\* | 0.16ns | 0.66 | 0.48\*\* | 0.124 | 0.135 | 102.87 | 13.27 |
| 1000-kernel weight (g) | 0.002ns | 2.68\*\* | 14.63 | 13.53\*\* | 1.32 | 1.62 | 110.44 | 3.43 |
| Harvest index (%) | 7.43ns | 17.13ns | 19.51 | 20.44\*\* | 10.74 | 12.16 | 104.55 | 9.72 |
| Plant height (cm) | 33.70ns | 18.45ns | 69.73 | 68.41\*\* | 13.99 | 14.98 | 101.63 | 6.09 |
| No. of fertile tillers plant-1 | 0.50\* | 0.08ns | 0.65 | 0.55\*\* | 0.13 | 0.12 | 91.50 | 12.84 |
| No. of spikelets spike-1 | 0.78ns | 0.53ns | 3.13 | 2.69\*\* | 0.83 | 0.76 | 91.81 | 5.88 |
| Spike length (cm) | 0.71ns | 0.29ns | 0.82 | 0.78\*\* | 0.27 | 0.28 | 100.09 | 7.82 |
| No. of kernels spike-1 | 23.32ns | 41.54\* | 67.82 | 65.07\*\* | 22.15 | 26.46 | 108.22 | 10.78 |

\*\* and ns indicates highly significant at (1%) and non-significant probability levels respectively, DF= degree freedom Rel.effic. = relative efficiency, RCBD=completely randomized block design, CV= coefficient of variations and adj. and unadj. = adjusted and unadjusted treatment mean square.

Table 4. Estimates of variability components for twelve traits of bread wheat genotypes evaluated at Werer Agricultural Research Center during 2019/20 under optimum condition

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Traits | Range | Mean ±SEM | δ2g | δ2p | GCV (%) | PCV (%) | H2b (%) | GA | GAM (%) |
| Days to heading (days) | 45.50-58.50 | 51.51±1.06 | 5.40 | 7.63 | 4.51 | 5.36 | 71.00 | 4.04 | 7.83 |
| Days to maturity (days) | 82.0-98.50 | 87.93±1.73 | 11.61 | 17.49 | 3.88 | 4.76 | 66.38 | 5.73 | 6.51 |
| Grain filling period(days) | 30.0-46.0 | 36.42±1.64 | 6.61 | 12.25 | 7.06 | 9.61 | 53.96 | 3.90 | 10.70 |
| Biomass yield (t ha-1) | 7.57-15.5 | 11.81±0.40 | 4.12 | 4.65 | 17.19 | 18.26 | 89.00 | 3.94 | 33.37 |
| Grain yield (t ha-1) | 2.30-6.0 | 4.05±0.23 | 0.71 | 0.81 | 20.84 | 22.21 | 87.65 | 1.63 | 40.33 |
| 1000 kernel weight(g) | 27.52-43.99 | 36.68±2.03 | 10.07 | 13.54 | 8.65 | 10.03 | 74.37 | 5.64 | 15.39 |
| Harvest index (%) | 25.41-41.32 | 34.09±1.86 | 8.22 | 10.66 | 8.42 | 9.68 | 75.51 | 5.14 | 15.09 |
| Plant height (cm) | 53.33-76.67 | 64.54±3.31 | 19.82 | 41.35 | 6.90 | 9.96 | 47.93 | 6.36 | 9.85 |
| Fertile tiller plant-1 | 1.25-5.75 | 3.75±0.47 | 0.41 | 0.86 | 17.07 | 24.73 | 48.00 | 0.91 | 24.32 |
| Spikelet spike-1 | 13.0-18.25 | 15.98±0.66 | 0.79 | 1.65 | 5.57 | 8.03 | 48.00 | 1.27 | 7.98 |
| Spike length (cm) | 4.83-8.83 | 6.97±0.48 | 0.26 | 0.60 | 7.28 | 11.15 | 43.33 | 0.68 | 9.80 |
| No. of kernels spike-1 | 29.83-55.67 | 45.29±3.24 | 17.87 | 38.84 | 9.33 | 13.76 | 46.00 | 5.91 | 13.06 |

δ2g = Genotypic variance, δ2p=Phenotypic variance, PCV=Phenotypic coefficient of variation, GCV=Genotypic coefficient of variation, H2b=Broad sense heritability GA=Genetic advance and GAM= Genetic advance as percentage of mean.

Table 5. Estimates of variability components for fourteen traits of bread wheat genotypes evaluated at Werer Agricultural Research Center during 2019/20 under stress condition

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Traits | Range | Mean ±SEM | δ2g | δ2p | GCV (%) | PCV (%) | H2b (%) | GA | GAM (%) |
| Days to heading (days) | 43.0-59.5 | 51.0±0.89 | 9.92 | 11.51 | 6.18 | 6.65 | 86.10 | 6.03 | 11.83 |
| Days to maturity (days) | 75.0-94.0 | 83.71±1.83 | 12.93 | 18.90 | 4.30 | 5.19 | 68.50 | 6.14 | 7.33 |
| Grain filling period(days) | 26.0-36.0 | 32.75±1.33 | 4.43 | 7.52 | 6.43 | 8.37 | 58.90 | 3.33 | 10.18 |
| Biomass yield (t ha-1) | 5.01-12.61 | 7.84±0.50 | 1.97 | 2.41 | 17.90 | 19.82 | 81.50 | 2.61 | 33.34 |
| Grain yield (t ha-1) | 1.01-4.36 | 2.65±0.25 | 0.16 | 0.28 | 15.48 | 20.22 | 58.60 | 0.65 | 24.45 |
| 1000 kernel weight(g) | 29.26-39.83 | 33.5±0.81 | 6.70 | 8.11 | 7.73 | 8.50 | 82.70 | 4.86 | 14.50 |
| Harvest index (%) | 20.21-38.28 | 33.72±2.32 | 3.69 | 15.81 | 5.70 | 11.79 | 23.40 | 1.92 | 5.69 |
| Plant height (cm) | 50.0-74.67 | 61.33±2.64 | 27.50 | 42.28 | 8.55 | 10.60 | 65.00 | 8.73 | 14.23 |
| Fertile tiller plant-1 | 1.66-4.1 | 2.81±0.25 | 0.26 | 0.38 | 18.41 | 22.27 | 68.40 | 0.87 | 31.23 |
| No. of Spikelets spike-1 | 13.0-18.33 | 15.53±0.64 | 1.18 | 1.95 | 7.00 | 8.99 | 60.60 | 1.75 | 11.25 |
| Spike length (cm) | 5.33-8.33 | 6.71±0.37 | 0.27 | 0.55 | 7.78 | 11.08 | 49.30 | 0.76 | 11.27 |
| No. of kernels spike-1 | 30.67-57.17 | 43.66±3.33 | 21.49 | 45.85 | 10.62 | 15.51 | 46.90 | 6.55 | 15.00 |

δ2g =genotypic variance, δ2p=Phenotypic variance, PCV=Phenotypic coefficient of variation, GCV=Genotypic coefficient of variation, H2b=Broad sense heritability GA=Genetic advance and GAM= Genetic advance as percentage of mean.

Appendix Table 1. Mean performance of sixty four bread wheat genotypes evaluated at Werer Agricultural Research Center during 2019/20 under optimum condition

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gen. | DH | DM | GFP | BY | GY | TKW | HI | PH | FTPP | SPS | SL | KPS |
| 1 | 56.0abc | 92.0b-h | 36.0d-j | 14.78ab | 5.13b-f | 37.56a-n | 34.87a-m | 72a-g | 3.66c-i | 17.16a-d | 7.16a-g | 44.0b-k |
| 2 | 55.5a-d | 88.0f-l | 32.5h-k | 8.83t-w | 2.63wxy | 31.76l-p | 29.89j-o | 64.83b-m | 1.25k | 13.66ijk | 5.83ghi | 45.0a-k |
| 3 | 54.5b-e | 89.5d-j | 35.0f-k | 14.71abc | 5.56abc | 39.87a-j | 37.76a-g | 68.17a-i | 4.5a-f | 15.6b-j | 7.33a-g | 51.83a-d |
| 4 | 51.0e-h | 85.0i-l | 37.5c-i | 11.26j-p | 4.50e-n | 38.62a-m | 39.93abc | 62.5e-m | 4.5a-f | 17.66ab | 6.83b-g | 51.0a-e |
| 5 | 52.0d-h | 88.5f-k | 35.0f-k | 8.88t-w | 3.59o-v | 32.0l-p | 40.66ab | 64.16f-m | 2.25h-k | 14.16g-k | 6.16e-i | 51.17a-e |
| 6 | 51.0e-h | 87.0g-l | 40.0b-f | 12.0h-n | 4.28g-o | 38.75a-l | 35.62a-l | 62.33e-m | 3.2d-j | 16.5a-f | 7.0b-g | 41.16d-k |
| 7 | 52.5c-f | 91.0c-i | 36.5c-i | 7.69vw | 2.63wxy | 27.52p | 33.1d-n | 54.16lm | 1.75jk | 13.0k | 5.12hi | 48.83a-h |
| 8 | 52.0d-h | 89.0e-k | 38.0c-h | 11.35i-p | 3.93k-t | 38.32a-m | 34.64b-m | 71.33a-g | 3.0e-j | 17.66ab | 7.83a-e | 55.33ab |
| 9 | 50.0fgh | 90.0d-j | 37.0c-i | 11.26j-p | 3.6o-u | 36.3b-o | 32.11e-n | 72.16a-g | 3.75c-h | 17.33abc | 6.83b-g | 35.17jkl |
| 10 | 45.5i | 87.0g-l | 37.5c-i | 15.47a | 6.0a | 35.56c-o | 38.85a-d | 56.5j-m | 5.5ab | 16.08a-h | 6.0f-i | 40.17e-l |
| 11 | 49.5gh | 83.0kl | 36.5c-i | 11.26j-p | 3.69n-u | 36.77b-o | 32.78d-n | 56klm | 3.16d-j | 14.33f-k | 7.33a-g | 45.66a-k |
| 12 | 58.5a | 86.0h-l | 30.0k | 10.22o-s | 2.6xy | 35.08d-o | 25.48o | 62.33e-m | 2.0ijk | 13.33jk | 6.11f-i | 42.5c-k |
| 13 | 52.5c-f | 88.5f-k | 40.0b-f | 13.22d-h | 4.71d-l | 33.08j-p | 35.63a-l | 53.33m | 3.83b-h | 16.5a-f | 7.33a-g | 55.67a |
| 14 | 56.0abc | 92.5b-f | 38.5c-g | 13.86b-f | 5.05c-g | 41.66a-e | 36.42a-j | 76ab | 4.5a-f | 16.5a-f | 8.0a-d | 40.5d-l |
| 15 | 50.0fgh | 94.5a-e | 33.0g-k | 8.68uvw | 2.78v-y | 33.79g-p | 32.07e-n | 67.16a-k | 2.0ijk | 14.0h-k | 4.83i | 48.66a-h |
| 16 | 51.0e-h | 83.0kl | 40.0b-f | 10.8n-q | 3.72m-u | 37.31a-o | 34.46b-n | 74.33abc | 3.0f-j | 16.5a-f | 8.17abc | 50.5a-f |
| 17 | 51.0e-h | 91.0c-i | 36.0d-j | 12.52g-j | 3.82m-u | 36.7b-o | 30.52i-o | 65.83a-l | 2.76g-k | 15.83b-i | 7.0b-g | 29.83l |
| 18 | 50.0fgh | 87.0g-l | 33.0g-k | 12.46g-l | 4.81c-j | 36.08b-o | 38.58a-e | 58.33h-m | 4.0b-g | 17.0a-d | 7.16a-g | 50.0a-f |
| 19 | 52.5c-f | 83.0kl | 33.5g-k | 10.33o-s | 3.57o-v | 43.99a | 34.56b-n | 62e-m | 3.0e-j | 15.5b-j | 7.33a-g | 46.0a-k |
| 20 | 48.5hi | 86.0h-l | 35.5e-k | 10.36o-s | 3.31q-x | 34.13g-p | 31.99f-n | 57.67i-m | 4.25a-g | 15.0d-k | 6.5c-i | 41.0d-k |
| 21 | 49.5gh | 84.0jkl | 38.0c-h | 9.05s-w | 3.11t-x | 33.47i-p | 34.46b-n | 66.17a-k | 3.41d-i | 16.0a-h | 7.0b-g | 42.17d-k |
| 22 | 50.0fgh | 87.5f-l | 35.0f-k | 9.11r-v | 3.53o-v | 35.65c-o | 38.79a-d | 63.67c-m | 3.83b-h | 14.5e-k | 7.0b-g | 38.5g-l |

Mean values in column of each trait followed by similar letter(s) had non-significant difference. DH=days to heading (days), DM=days to maturity (days), GFP=grain filling period (days), BY=biomass yield (t ha-1), GY=grain yield (t ha-1), TKW= Thousand-kernel weight (g), HI=Harvest index (%), PH=plant height (cm), FTPP=fertile tiller per plant, SPS=Spikelets spike-1, SL=Spike length (cm), KPS= number of kernels spike-1.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gen. | DH | DM | GFP | BY | GY | TKW | HI | PH | FTPP | SPS | SL | KPS |
| 23 | 52.5c-f | 85.0i-l | 46.0a | 11.08k-q | 4.19h-p | 31.06nop | 37.82a-g | 67.66a-j | 3.66c-i | 15.75b-i | 6.33d-i | 41.66d-k |
| 24 | 53.5b-f | 98.5a | 35.5e-k | 14.89ab | 5.3a-e | 42.7abc | 35.68a-l | 72.17a-f | 4.25a-g | 17.66ab | 7.0b-g | 53.67abc |
| 25 | 50fgh | 89e-k | 35f-k | 12.40g-l | 3.84m-t | 40.63a-h | 31.0h-o | 65b-l | 4.33a-g | 16a-h | 7.5a-g | 47.83a-i |
| 26 | 48.5hi | 85i-l | 37.5c-i | 14.02bcde | 5.06c-g | 40.53a-i | 36.12a-k | 74.17a-d | 4.5a-f | 18.25a | 7.17a-g | 48.16a-h |
| 27 | 55a-d | 86h-l | 34g-k | 12.24g-m | 3.98k-s | 36.87b-o | 32.49d-n | 65.5a-l | 3.25d-j | 16.66a-e | 8.83a | 48.5a-h |
| 28 | 51e-h | 89e-k | 41a-e | 11.95h-n | 4.87c-i | 35.61c-o | 41.32a | 72.83a-e | 3.91b-h | 17.66ab | 7.33a-g | 50.5a-f |
| 29 | 50fgh | 92b-h | 35f-k | 14.11bcd | 4.55e-m | 37.05a-o | 32.1e-n | 58.66h-m | 5.25abc | 15d-k | 6.17e-i | 43c-k |
| 30 | 51e-h | 85i-l | 37c-i | 13.39c-g | 4.7d-l | 441.59a-e | 35.09a-m | 76.66a | 4.66a-f | 16.83a-d | 7.5a-g | 49.16a-g |
| 31 | 51e-h | 88f-l | 36.5c-i | 12.47g-k | 4.84c-i | 33.84g-p | 38.84a-d | 67.16a-k | 3.58c-i | 17.33abc | 7b-g | 42.5c-k |
| 32 | 48.5hi | 87.5f-l | 33.5g-k | 10.99m-q | 3.65o-u | 34.36f-p | 33.22d-n | 58.67h-m | 3.33d-i | 17.67ab | 7.67a-f | 51.83a-d |
| 33 | 50fgh | 82l | 35f-k | 9.74q-u | 3.39p-x | 33.51h-p | 34.82a-m | 64.5b-m | 5.75a | 17.16a-d | 7.16a-g | 51.5a-e |
| 34 | 51e-h | 86h-l | 35f-k | 11.27j-p | 4.01j-s | 39.68a-k | 35.54a-l | 57.5i-m | 4.5a-f | 15.83b-i | 6.5c-i | 47.33a-i |
| 35 | 49.5gh | 87g-l | 37.5c-i | 10.28o-s | 3.24r-x | 35.59c-o | 31.47g-o | 57i-m | 3.4d-i | 16a-h | 6.5c-i | 46a-k |
| 36 | 50fgh | 85i-l | 35f-k | 11.21j-p | 3.77m-u | 36.12b-o | 33.52c-n | 60.66f-m | 3.66c-i | 17.5abc | 6.66b-h | 44.83a-k |
| 37 | 51e-h | 89e-k | 38c-h | 11.10k-q | 4.13h-q | 34.77e-o | 37.26a-h | 66.66a-k | 4.16a-g | 16a-h | 6.66b-h | 51a-e |
| 38 | 56abc | 89e-k | 33g-k | 7.57w | 2.3y | 33.5h-p | 29.59l-o | 64.16c-m | 3.25d-j | 13k | 5hi | 47.16a-i |
| 39 | 52.5c-f | 88.5f-k | 36d-j | 14.23a-d | 5.31a-e | 40.78a-g | 37.3a-h | 63.83c-m | 4.5a-f | 17.75ab | 7.16a-g | 46.5a-j |
| 40 | 51e-h | 85i-l | 34g-k | 11.28j-p | 3.98k-s | 30.35op | 35.25 a-l | 56.66i-m | 3.91b-h | 16.66a-e | 6.83b-g | 51.17a-e |
| 41 | 53.5b-f | 89.5d-j | 36d-j | 11.46i-o | 3.86m-t | 36.73b-o | 33.65c-n | 65.66a-l | 4.75a-e | 15.5b-j | 7b-g | 50.5a-f |
| 42 | 51e-h | 96abc | 45ab | 11.33j-p | 3.9l-t | 42.66abc | 34.51b-n | 60.5g-m | 3.75c-h | 15.66b-i | 7b-g | 46.17a-k |
| 43 | 51e-h | 83kl | 32ijk | 11.07l-q | 4.18h-p | 40.33a-i | 37.69a-g | 62.33e-m | 3.95b-g | 16.33a-g | 7b-g | 39.33f-l |
| 44 | 48.5hi | 83kl | 34.5f-k | 14.33a-d | 5.4a-d | 42.12a-d | 37.68a-g | 58.17i-m | 4.25a-g | 17a-d | 6.16e-i | 34.83kl |
| 45 | 51e-h | 87g-l | 36d-j | 13.24d-h | 4.94c-h | 35.86c-o | 37.39a-h | 63.5c-m | 4.16a-g | 16.83a-d | 8.33ab | 51a-e |

Mean values in column of each trait followed by similar letter(s) had non-significant difference. DH=days to heading (days), DM=days to maturity (days), GFP=grain filling period (days), BY=biomass yield (t ha-1), GY=grain yield (t ha-1), TKW= Thousand-kernel weight (g), HI=Harvest index (%), PH=plant height (cm), FTPP=fertile tiller per plant, SPS=Spikelets spike-1, SL=Spike length (cm), KPS= number of kernels spike-1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gen. | DH | DM | GFP | BY | GY | TKW | HI | PH | FTPP | SPS | SL | KPS |
| 46 | 48.5hi | 86h-l | 37.5c-i | 11.95h-n | 4.21h-p | 37.31a-o | 35.30a-l | 64.83b-m | 4.58a-f | 16.66a-e | 6.33d-i | 44.5a-k |
| 47 | 51e-h | 88f-l | 37c-i | 10.8n-q | 3.29r-x | 43.19ab | 30.5i-o | 63.16c-m | 3.75c-h | 15.83b-i | 6.66b-h | 36.5i-l |
| 48 | 50fgh | 85i-l | 35f-k | 13.27d-h | 4.84c-i | 35.92c-o | 36.42a-j | 66.67a-k | 4.4a-g | 15.91b-i | 6.5c-i | 38.5g-l |
| 49 | 49.5gh | 87.5f-l | 38c-h | 13.87b-f | 5.05c-g | 37.97a-n | 36.38a-j | 59.16h-m | 3.66c-i | 15.33c-j | 7.33a-g | 43.16c-k |
| 50 | 52d-h | 93.5a-f | 41.5a-d | 12.56f-j | 4.74c-k | 34.29f-p | 37.81a-g | 63.66c-m | 3.66c-i | 15.83b-i | 6.17e-i | 40.17e-l |
| 51 | 56abc | 89.5d-j | 33.5g-k | 9.96p-u | 3.58o-v | 34.76e-o | 35.97a-k | 62.66d-m | 3.86b-h | 16.5a-f | 5.83ghi | 47.83a-i |
| 52 | 55a-d | 97ab | 42abc | 10.08o-t | 3.30q-x | 35.71c-o | 32.77d-n | 66..16a-k | 3.35d-i | 15.67b-i | 6.67b-h | 37.5h-l |
| 53 | 52d-h | 87g-l | 35f-k | 9.31r-u | 3.22s-x | 32.66k-p | 34.54b-n | 67.66a-j | 3.41d-i | 14.16h-k | 6.66b-h | 50.66a-f |
| 54 | 48.5hi | 83kl | 34.5f-k | 14.75ab | 4.68d-l | 37.84a-n | 31.62f-o | 64.66b-m | 4.66a-f | 16.33a-g | 8a-d | 47.16a-i |
| 55 | 56.5ab | 93.5a-f | 37c-i | 14.88ab | 4.36f-o | 42.61abc | 29.31l-o | 73a-e | 4.25a-g | 17.16a-d | 8.33ab | 43.67c-k |
| 56 | 50fgh | 85i-l | 35f-k | 10.71n-q | 2.72wxy | 33.69g-p | 25.41o | 71.83a-g | 3.0f-j | 14h-k | 5hi | 44b-k |
| 57 | 55b-e | 96.5abc | 42abc | 10.46o-r | 3.0u-x | 35.97c-o | 28.71mno | 73.33a-e | 4.83a-d | 14.5e-k | 6.61c-h | 41.66d-k |
| 58 | 54b-e | 95a-d | 41a-e | 12.72e-i | 4.06i-r | 39.62a-k | 31.87f-n | 67.17a-k | 3.41d-i | 16.16a-h | 6.66b-h | 47a-i |
| 59 | 54.5b-e | 87g-l | 32.5h-k | 12.22g-m | 3.42p-w | 38.31a-m | 28.08no | 70a-h | 4.0b-g | 16.5a-f | 633d-i | 41.5d-k |
| 60 | 51e-h | 86h-l | 35f-k | 11.39i-o | 3.78m-u | 42.18a-d | 33.22d-n | 64.66b-m | 3.31d-j | 16.16a-h | 6.16e-i | 45a-k |
| 61 | 50fgh | 86h-l | 36d-j | 9.21r-v | 3.24r-x | 36.49b-o | 35.2a-m | 60.5g-m | 3.5d-i | 15.33c-j | 7.16a-g | 40.5d-l |
| 62 | 45.5i | 83kl | 37.5c-i | 13.16d-h | 4.84c-i | 40.16a-j | 36.9a-i | 57.83i-m | 4.16a-g | 15.83b-i | 6.16e-i | 41.5d-k |
| 63 | 52.5c-f | 83kl | 30.5jk | 8.83t-w | 2.63wxy | 31.5m-p | 29.75k-o | 62.83c-m | 2.0ijk | 13.66ijk | 5.1hi | 39.5f-l |
| 64 | 49.5gh | 88f-l | 38.5c-g | 15.5a | 5.89ab | 41.33a-f | 38.06a-f | 63.33c-m | 4.67a-f | 17.33abc | 8a-d | 49.16a-g |
| Mean | 51.51 | 87.93 | 36.42 | 11.81 | 4.05 | 36.68 | 34.09 | 64.54 | 3.76 | 15.98 | 6.97 | 45.29 |

Mean values in column of each trait followed by similar letter(s) had non-significant difference. DH=days to heading (days), DM=days to maturity (days), GFP=grain filling period (days), BY=biomass yield (t ha-1), GY=grain yield (t ha-1), TKW= Thousand-kernel weight (g), HI=Harvest index (%), PH=plant height (cm), FTPP=fertile tiller per plant, SPS=Spikelets spike-1, SL=Spike length (cm), KPS= number of kernels spike-1.

Appendix Table 2. Mean performance of sixty four bread wheat genotypes evaluated at middle Awash during 2019/20 under stress condition

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gen. | DH | DM | GFP | BY | GY | TKW | HI | PH | FTPP | SPS | SL | KPS |
| 1 | 59a | 90abc | 31b-g | 8e-m | 3.05b-i | 39.83a | 38.08a | 52.5tuv | 1.66l | 14.33h-o | 5.66ij | 35.5j-n |
| 2 | 51de | 80h-m | 29d-h | 8e-m | 2.52e-p | 31.02v-z | 31.44a-g | 65.85a-l | 3.50a-f | 15.67c-l | 6.33e-j | 50.0a-g |
| 3 | 51de | 84c-j | 32a-f | 9.28b-h | 3.26b-h | 36.8c-i | 35.07a-f | 64.5b-n | 2.66f-k | 15.33d-n | 6.16f-j | 47.83a-i |
| 4 | 51de | 85c-i | 34a-c | 7.33i-p | 2.60d-o | 33.89j-u | 35.05a-f | 68.33a-f | 2.83d-j | 17.33a-e | 6.66c-i | 47.0a-j |
| 5 | 49ef | 83d-k | 34a-c | 7.65g-n | 2.68c-n | 32.24n-z | 34.86a-f | 59.5e-u | 2.83d-j | 13.83j-o | 7.0b-h | 44.5b-l |
| 6 | 51de | 88a-e | 36a | 7.25i-p | 2.73b-n | 29.62yz | 37.62ab | 56.66l-v | 2.16i-l | 15.66c-l | 5.33j | 41.0d-n |
| 7 | 59.5a | 86.5b-g | 27hg | 8e-m | 2.08k-r | 29.61yz | 25.77gh | 50v | 2.33h-l | 18.0ab | 5.83hij | 57.16a |
| 8 | 51de | 82.5e-l | 31b-g | 10.16bc | 3.4bcd | 34.84e-o | 33.49a-g | 70.33abc | 2.83d-j | 16.83a-g | 6.16f-j | 47.17a-j |
| 9 | 50de | 85c-i | 35ab | 7.33i-p | 2.45g-q | 30.56w-z | 33.45a-g | 57.5i-v | 2.83d-j | 15.6e-o | 7.0b-h | 32.5mn |
| 10 | 43g | 75m | 32a-f | 9b-i | 3.00b-j | 32.3n-z | 33.33a-g | 58.0i-v | 2.33h-l | 14.83g-o | 5.83hij | 38.67g-n |
| 11 | 49ef | 79.5i-m | 28e-h | 8.33d-l | 2.99b-j | 37.29a-f | 35.84a-d | 58.83g-v | 2.66f-k | 13.5l-o | 6.16f-j | 44.83b-k |
| 12 | 59.5a | 92ab | 32.5a-e | 6.22n-q | 1.70p-s | 36.99b-h | 27.2e-g | 69.0a-d | 2.33h-l | 17.67abc | 7.66a-d | 48.3a-i |
| 13 | 49ef | 83d-k | 33a-d | 7.66g-n | 2.45g-q | 29.62yz | 31.92a-g | 53.5q-v | 3.5a-f | 15.0f-o | 7.67a-d | 46.67a-j |
| 14 | 59a | 91.5ab | 32.5a-e | 8.55c-k | 2.97b-j | 35.08e-n | 34.54a-f | 61.83c-s | 2.0jkl | 13.5l-o | 6.5d-j | 37.0i-n |
| 15 | 50de | 84c-j | 34a-c | 6.3m-q | 2.12k-r | 31.61q-z | 33.76a-g | 65.5a-m | 3.0b-i | 16.17a-i | 7.33a-f | 47.67a-i |
| 16 | 51de | 86b-g | 35ab | 7.33i-p | 2.59d-o | 33.27l-w | 35.32a-e | 62.33c-q | 3.0b-i | 16.0b-j | 7.0b-h | 48.66a-i |
| 17 | 49ef | 83d-k | 33a-d | 5.89opq | 1.82o-r | 31.29u-z | 30.71a-g | 59.0g-v | 2.33h-l | 14.16i-o | 7.5a-e | 33.17k-n |
| 18 | 49ef | 78j-m | 30c-g | 7.58h-o | 2.59d-o | 30.17w-z | 33.84a-g | 56.50m-v | 2.83d-j | 15.0f-o | 6.83c-i | 45.5b-j |
| 19 | 50de | 84c-j | 34a-c | 10.0bcd | 3.33b-f | 34.52f-p | 33.48a-g | 56.0n-v | 2.83d-j | 14.83g-o | 6.83c-i | 41.83c-n |
| 20 | 49ef | 82e-l | 33a-d | 8.33d-l | 2.87b-k | 32.15o-z | 34.50a-f | 63.33b-o | 3.16b-h | 16.5a-h | 6.75c-i | 45.83a-j |
| 21 | 49ef | 83d-k | 33a-d | 9.37b-g | 2.62d-o | 31.91p-z | 28.14d-g | 61.0d-t | 3.75abc | 15.0f-o | 6.83c-i | 37.16i-n |
| 22 | 49ef | 80h-m | 31b-g | 8.0e-m | 2.80b-m | 32.34n-z | 34.95a-f | 54.0p-v | 3.16b-h | 13.17no | 6.83c-i | 37.16i-n |

Mean values in column of each trait followed by similar letter(s) had non-significant difference. DH=days to heading (days), DM=days to maturity (days), GFP=grain filling period (days), BY=biomass yield (t ha-1), GY=grain yield (t ha-1), TKW= Thousand-kernel weight (g), HI=Harvest index (%), PH=plant height (cm), FTPP=fertile tiller per plant, SPS=Spikelets spike-1, SL=Spike length (cm), KPS= number of kernels spike-1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gen. | DH | DM | GFP | BY | GY | TKW | HI | PH | FTPP | SPS | SL | KPS |
| 23 | 59a | 94a | 35ab | 9.47b-f | 3.31b-f | 35.02e-n | 34.87a-f | 71.67ab | 3.67a-d | 15.67c-l | 7.33a-f | 43.33b-m |
| 24 | 50de | 84c-j | 34a-c | 9.81bcd | 3.56b | 34.72e-p | 36.13a-d | 71.83ab | 2.5h-l | 16.5a-h | 7.0b-h | 43.8b-m |
| 25 | 51de | 87b-f | 36a | 8e-m | 2.69c-n | 36.46d-k | 33.67a-g | 62.66b-q | 2.33h-l | 16.17a-i | 7.83abc | 53.67ab |
| 26 | 51de | 86b-g | 36a | 8.89b-j | 3.19b-h | 37.48a-e | 35.9a-d | 70.67abc | 2.33h-l | 18.0ab | 7.0b-h | 49.0a-h |
| 27 | 50de | 83d-k | 33a-d | 8.67c-k | 3.19b-h | 33.02m-x | 36.77abc | 61.0d-t | 3.75abc | 16.16a-i | 7.16a-g | 39.0g-n |
| 28 | 54.5bc | 89a-d | 31.5a-g | 12.61a | 4.36a | 32.97m-x | 34.93a-f | 58.33h-v | 2.08jkl | 18.33a | 7.66a-d | 50.33a-g |
| 29 | 49ef | 76.5l-m | 27.5fgh | 8.0e-m | 2.80b-m | 35.26e-m | 35.1a-f | 60.0d-u | 3.67a-d | 14.5h-o | 6.0h-j | 44.5b-l |
| 30 | 52.5b-d | 86b-g | 33.5a-d | 8.95b-i | 3.25b-h | 33.68k-v | 36.13a-d | 68.83a-d | 2.9c-j | 16.17a-i | 6.83c-i | 45.33b-j |
| 31 | 49ef | 81f-m | 32a-f | 7.16j-o | 2.50f-p | 33.49l-v | 35.05a-f | 66.67a-i | 2.0jkl | 15.5c-m | 7.33a-f | 45.0b-j |
| 32 | 49ef | 82e-l | 33a-d | 7.65g-n | 2.27i-r | 32.49m-y | 29.77b-g | 54.17o-v | 2.33h-l | 16.5a-h | 7.0b-h | 47.0a-j |
| 33 | 49ef | 83d-k | 33a-d | 7.79f-n | 2.62d-o | 33.49l-v | 33.89a-f | 60.85d-t | 3.16b-h | 16.16a-i | 6.5d-j | 51.17a-f |
| 34 | 49ef | 80.5g-m | 35ab | 5.85opq | 1.92n-r | 35.94d-l | 32.53a-g | 62.17c-r | 2.5h-l | 16.0b-j | 6.83c-i | 45.33b-j |
| 35 | 49ef | 84c-j | 35ab | 5.12pq | 1.57r-s | 32.24n-z | 30.85a-g | 54.66o-v | 2.75e-j | 13.5l-o | 6.0h-j | 46.5a-j |
| 36 | 50de | 85c-i | 35ab | 7.67g-n | 2.61d-o | 29.95xyz | 34.06a-f | 54.16o-v | 2.33h-l | 16.5a-h | 6.66c-i | 43.17b-m |
| 37 | 51de | 86b-g | 34a-c | 6.66l-q | 2.22i-r | 37.04b-g | 33.41a-g | 66.67a-i | 3.06b-i | 15.66c-l | 6.66c-i | 45.66a-j |
| 38 | 51.5de | 85c-i | 36a | 5.68pq | 2.04k-r | 31.43s-z | 36.01a-d | 57.16j-v | 2.16i-l | 17.16a-f | 7.17a-g | 38.83g-n |
| 39 | 49ef | 77.5k-m | 28e-h | 6.33m-q | 2.19j-r | 32.15o-z | 34.63a-f | 57.83i-v | 3.0b-i | 14.5h-o | 6.33e-j | 48.5a-i |
| 40 | 49ef | 85c-i | 36a | 10.46b | 3.56b | 31.53r-z | 34.07a-f | 52.83s-v | 2.9c-j | 15.5c-m | 7.0b-h | 42.66b-m |
| 41 | 52.5b-d | 83d-k | 31b-g | 8.75b-k | 3.34b-e | 34.34g-r | 38.28a | 66.33a-j | 2.5h-l | 15.67c-l | 6.83c-i | 51.5a-e |
| 42 | 49ef | 77.5k-m | 29.5c-h | 5.01q | 1.01s | 31.32t-z | 20.21h | 60.66d-t | 2.06jkl | 15.16e-o | 6.33e-j | 40.5e-n |
| 43 | 46f | 77.5k-m | 31.5a-g | 6.67l-q | 2.37h-r | 31.60q-z | 35.6a-d | 58.67g-v | 4.1a | 13.0o | 6.33e-j | 45.83a-j |
| 44 | 49ef | 79.5i-m | 34a-c | 6.37m-q | 2.25i-r | 38.48abc | 35.37a-d | 58.17i-v | 3.16b-h | 13.3mno | 6.33e-j | 32.33mn |
| 45 | 49ef | 85c-i | 36a | 8.94b-i | 3.20b-h | 38.34a-d | 35.81a-d | 67.66a-g | 3.16b-h | 15.33d-n | 8.18ab | 38.0h-n |

Mean values in column of each trait followed by similar letter(s) had non-significant difference. DH=days to heading (days), DM=days to maturity (days), GFP=grain filling period (days), BY=biomass yield (t ha-1), GY=grain yield (t ha-1), TKW= Thousand-kernel weight (g), HI=Harvest index (%), PH=plant height (cm), FTPP=fertile tiller per plant, SPS=Spikelets spike-1, SL=Spike length (cm), KPS= number of kernels spike-1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gen. | DH | DM | GFP | BY | GY | TKW | HI | PH | FTPP | SPS | SL | KPS |
| 46 | 49ef | 84c-j | 35ab | 6.54m-q | 2.33i-r | 39.66ab | 36.41abc | 56.16n-v | 2.83d-j | 14.83g-o | 5.33j | 52.33a-d |
| 47 | 49ef | 78j-m | 29.5c-h | 6.1n-q | 2.08k-r | 33.66k-v | 34.11a-f | 59.33f-u | 3.83ab | 13.83j-o | 6.16f-j | 40.16e-n |
| 48 | 51de | 86b-g | 35ab | 9.33b-h | 3.48bc | 29.44z | 37.29abc | 51.0uv | 2.16i-l | 15.83b-k | 7.17a-g | 30.66n |
| 49 | 49ef | 83d-k | 36a | 7.33i-p | 2.52e-p | 31.03v-z | 34.21a-f | 62.83b-p | 3.0b-i | 15.16e-o | 7.16a-g | 42.5b-m |
| 50 | 53cbd | 89a-d | 36a | 7.83f-n | 2.74b-n | 30.34w-z | 35.27a-e | 54.83o-v | 3.5a-f | 16.16a-i | 6.33e-j | 46.83a-j |
| 51 | 59a | 90abc | 30c-g | 7.5i-o | 2.58d-o | 30.27w-z | 34.40a-f | 58.33i-v | 2.67f-k | 16.33a-i | 5.67ij | 41.66c-n |
| 52 | 50de | 83.5d-k | 31.5a-g | 5.65pq | 1.67q-s | 29.91xyz | 29.37c-g | 58.66g-v | 2.83d-j | 14.33h-o | 6.0h-j | 53.33abc |
| 53 | 51de | 82e-l | 31b-g | 8.89b-j | 3.18b-h | 34.15i-t | 35.54a-d | 74.66a | 2.83d-j | 17.5a-d | 6.83c-i | 32.83lmn |
| 54 | 51de | 83d-k | 32a-f | 9.8bcd | 2.67c-n | 33.85j-v | 27.1fgh | 66.0a-k | 2.33h-l | 17.5a-d | 7.33a-f | 47.33a-i |
| 55 | 58a | 90abc | 32a-f | 10.41b | 3.31b-f | 33.18l-w | 31.76a-g | 53.0r-v | 3.0b-i | 16.33a-i | 8.33a | 51.0a-f |
| 56 | 51de | 85c-i | 34a-c | 6.16n-q | 2.00m-r | 33.74k-v | 32.42a-g | 68.66a-f | 2.16i-l | 16.0b-j | 6.83c-i | 46.0a-j |
| 57 | 51de | 84.5c-i | 33.5a-d | 8e-m | 2.84b-l | 34.23h-s | 35.44a-d | 70.83abc | 3.0b-i | 15.17e-o | 7.5a-e | 39.0g-n |
| 58 | 52cde | 86b-g | 34a-c | 9.66b-e | 3.05b-i | 34.41g-q | 31.59a-g | 67.0a-h | 1.83kl | 16.33a-i | 7.0b-h | 37.33h-n |
| 59 | 51de | 86b-g | 35ab | 8e-m | 2.77b-m | 34.52f-p | 34.67a-f | 66.33a-j | 3.58a-e | 15.83b-k | 6.16f-j | 41.0d-n |
| 60 | 55b | 86b-g | 34a-c | 7.0k-p | 2.65c-o | 32.74m-x | 37.81ab | 64.67b-n | 1.83kl | 16.0b-j | 6.0h-j | 45.33b-j |
| 61 | 50de | 82e-l | 32a-f | 8.33d-l | 2.82b-m | 29.88xyz | 33.87a-f | 57.0k-v | 3.16b-h | 14.83g-o | 6.67c-i | 39.5f-n |
| 62 | 49ef | 75m | 26h | 6.54m-q | 2.04k-r | 33.78k-v | 31.0a-g | 56.67l-v | 3.41a-g | 14.83g-o | 6.33e-j | 44.16b-l |
| 63 | 49ef | 79.5i-m | 32.5a-e | 6.33m-q | 2.29i-r | 36.64c-j | 36.1a-d | 65.66a-m | 4.05a | 13.66k-o | 6.17f-j | 33.0lmn |
| 64 | 50de | 83d-k | 32.5a-e | 6.10n-q | 2.03l-r | 39.83a | 33.97a-f | 65.5a-m | 2.58g-k | 15.0f-o | 6.0h-j | 44.17b-l |
| Mean | 51.0 | 83.71 | 32.75 | 7.84 | 2.65 | 33.50 | 33.72 | 61.33 | 2.81 | 15.53 | 6.71 | 43.66 |

Mean values in column of each trait followed by similar letter(s) had non-significant difference. DH=days to heading (days), DM=days to maturity (days), GFP=grain filling period (days), BY=biomass yield (t ha-1), GY=grain yield (t ha-1), TKW= Thousand-kernel weight (g), HI=Harvest index (%), PH=plant height (cm), FTPP=fertile tiller per plant, SPS=Spikelets spike-1, SL=Spike length (cm), KPS= number of kernels spike-1.